EGU22-10860 CL3.2.2

Can reforestation help stabilize the climate in net-zero pathways?

Alexander J. MacIsaac, Alexander Koch, & Kirsten Zickfeld

Simon Fraser University, Burnaby, British Columbia

e: alexander_macisaac@sfu.ca

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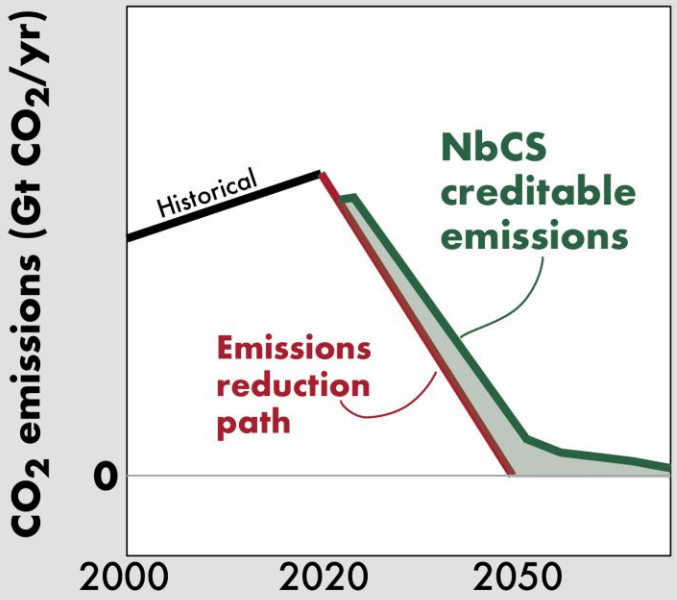
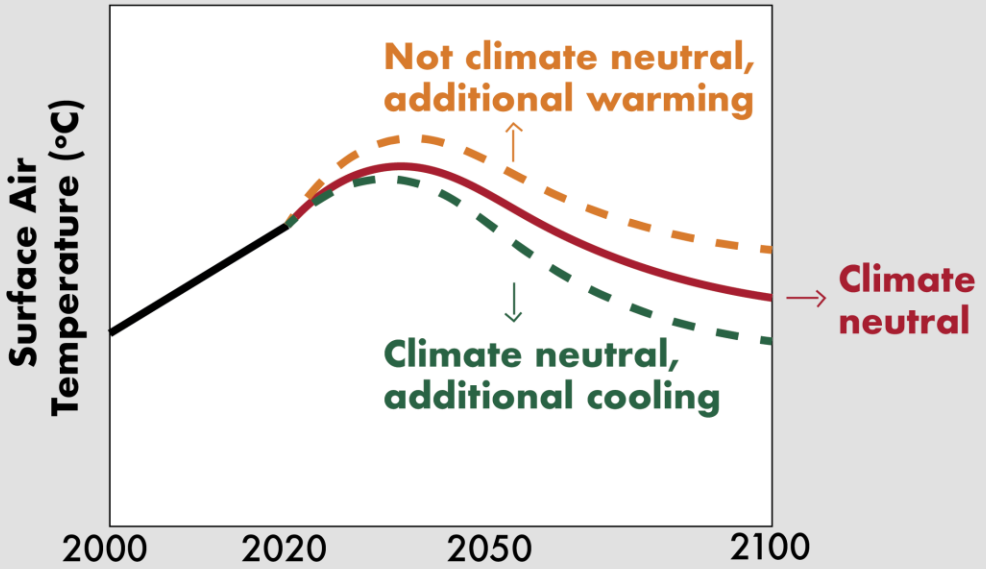
Motivation, Questions



Negative emissions are feasible with nature-based climate solutions…

Carbon credit offsets not yet assessed in a fully coupled ESM…



Will carbon offset driven reforestation neutralize the climate change that would occur without carbon offsets?

e: alexander_macisaac@sfu.ca
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Design

Deep fossil fuel mitigation + global reforestation

Climate neutral baseline:

- Fossil Fuel CO_2 emissions = decline linearly from 2020 to zero by 2050
- Non-CO_2 radiative forcing = follows deep mitigation path – SSP1-1.9

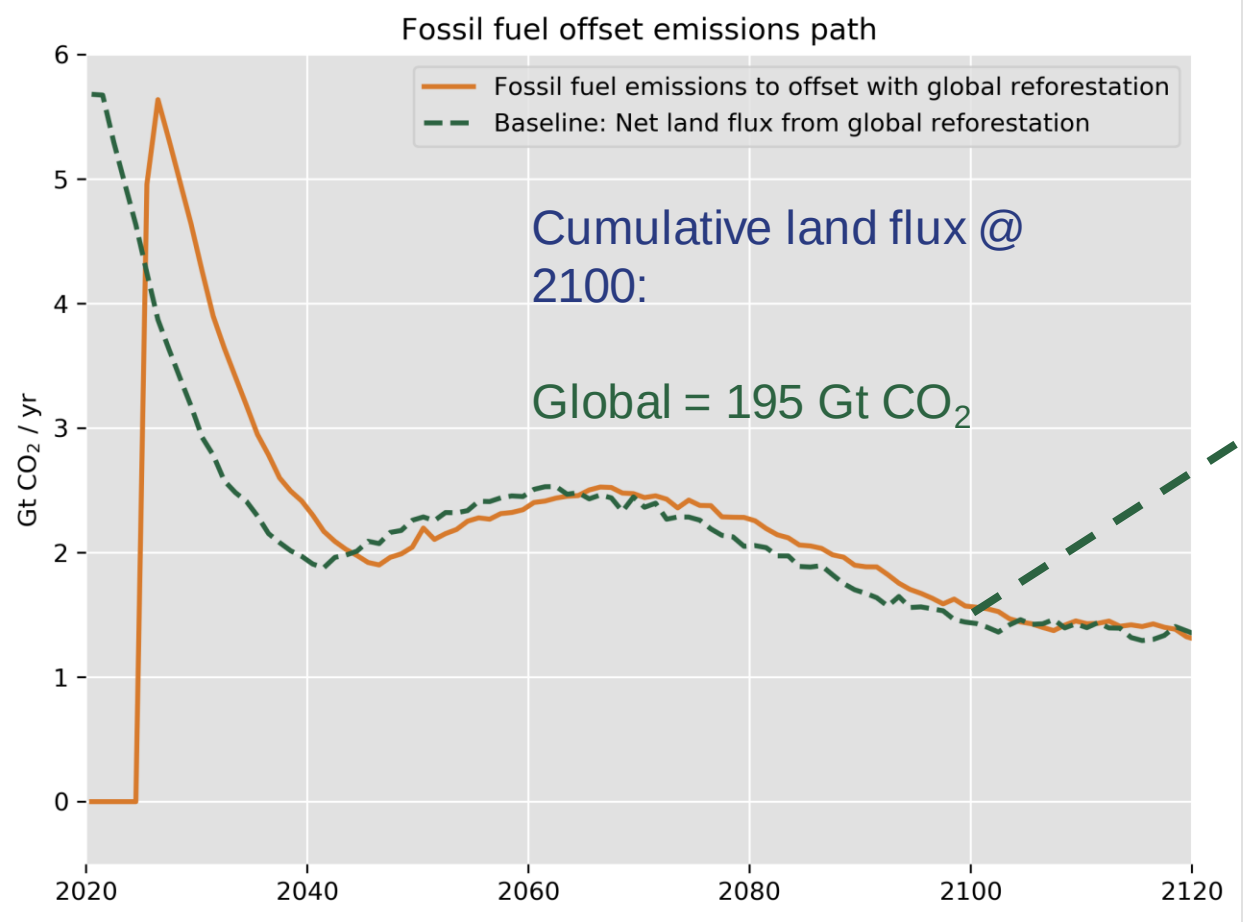
CO_2 sequestration baseline:

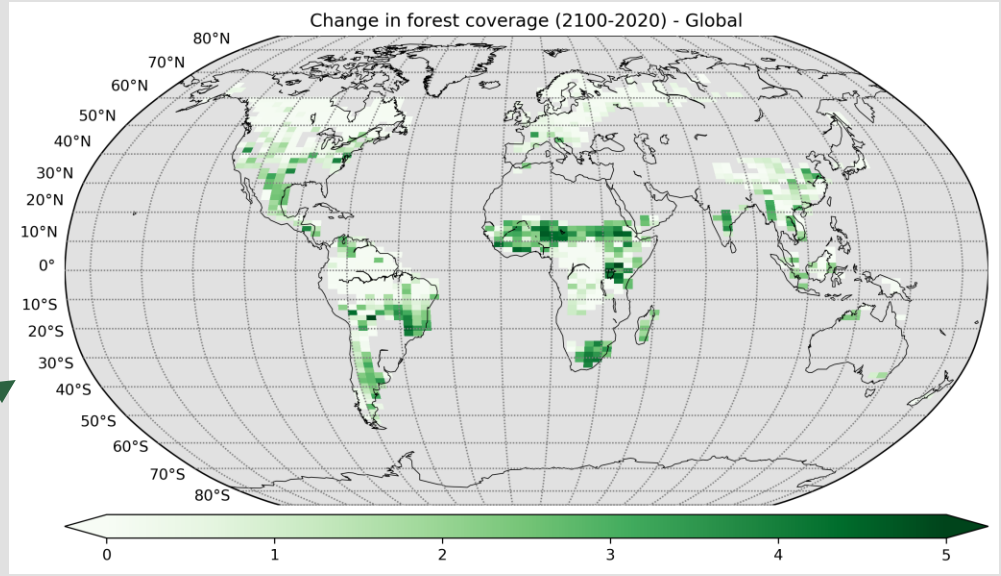
- Climate neutral baseline + global reforestation

e: alexander_macisaac@sfu.ca

Design

Fossil fuel mitigation with additional emissions offset by global reforestation





1 tCO_2 sequestered by reforestation allows for

1 tCO_2 fossil fuel sources, five years later

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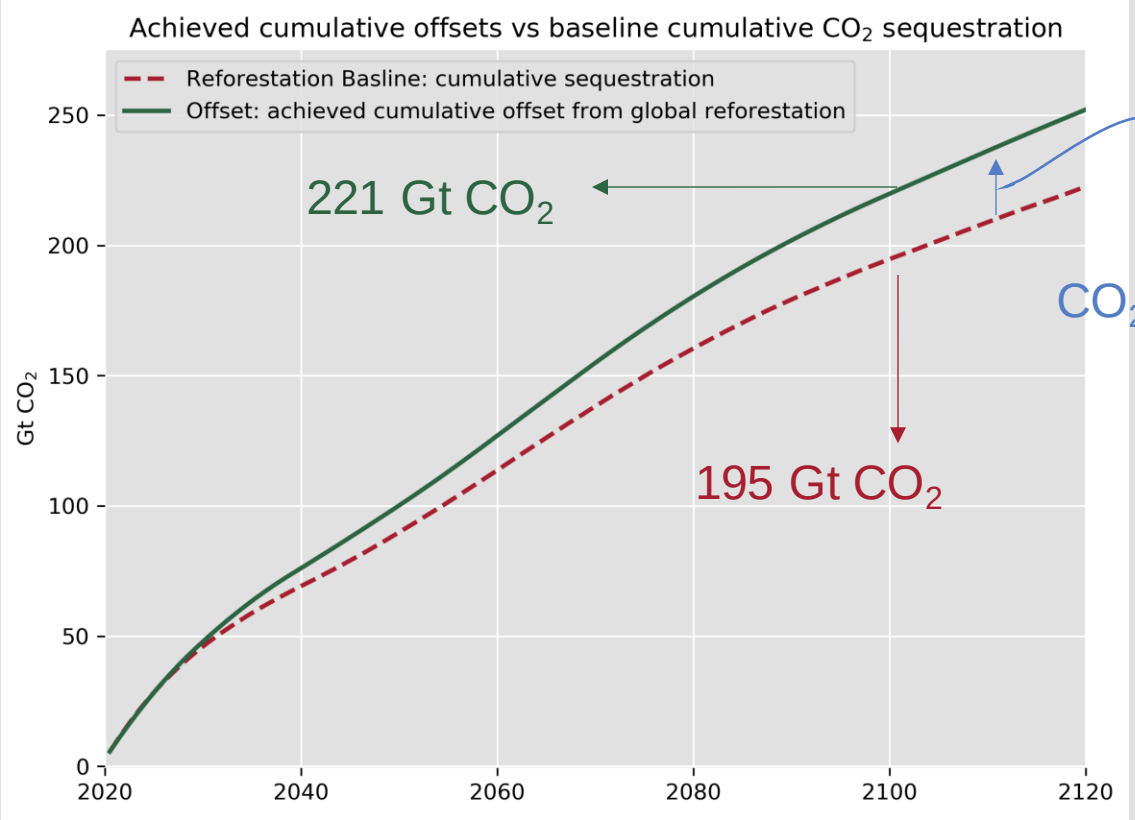
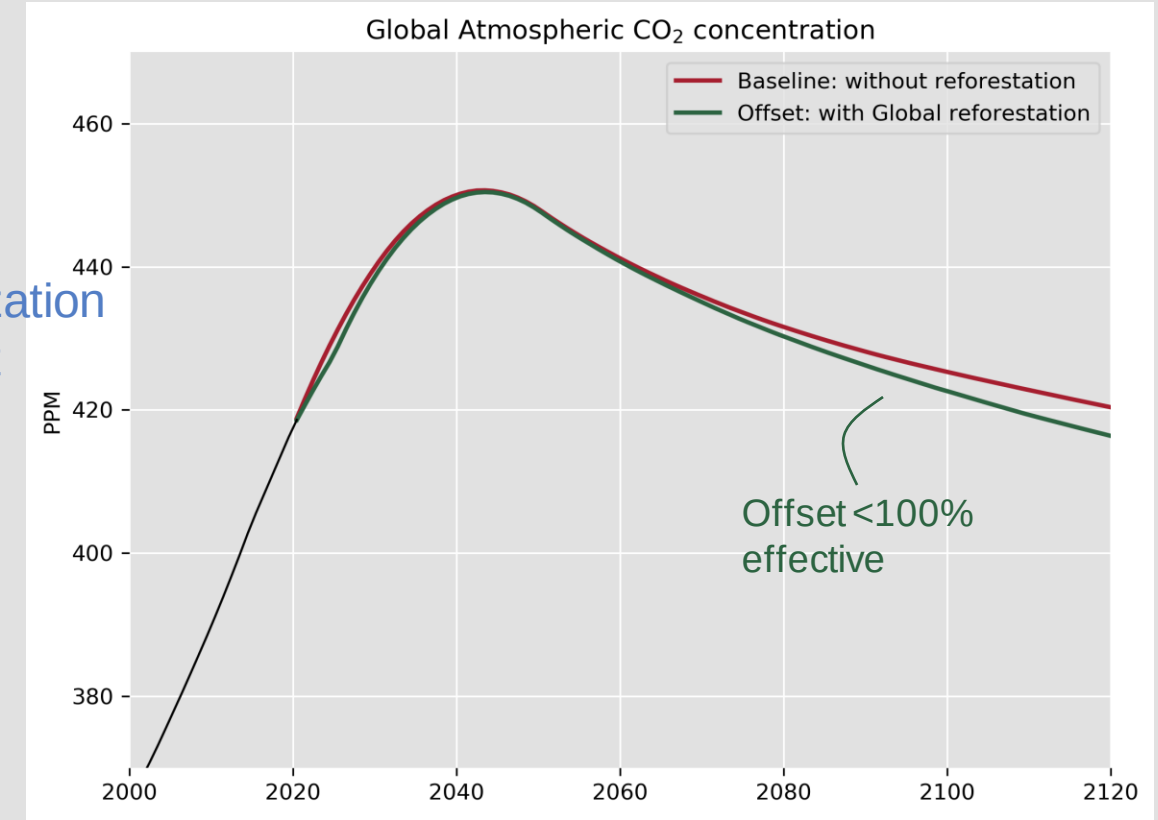
Net zero

CO_2 sequestration in reforested areas enhanced by CO_2 fertilization effect from additional emissions

Compared to climate neutral baseline, offset path achieves lower atmospheric CO_2 concentration





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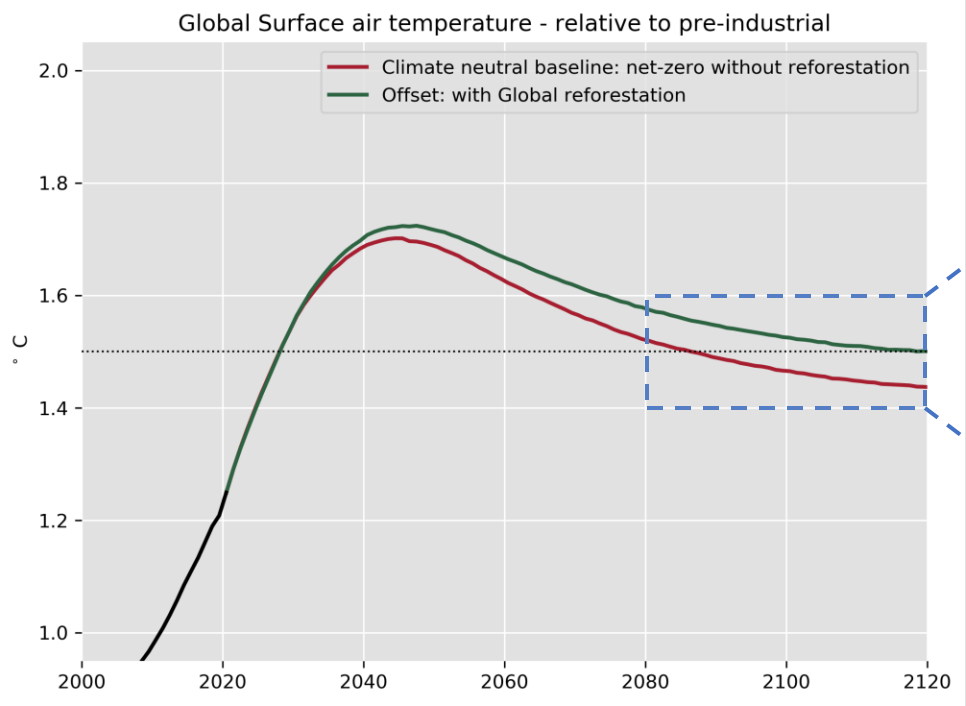
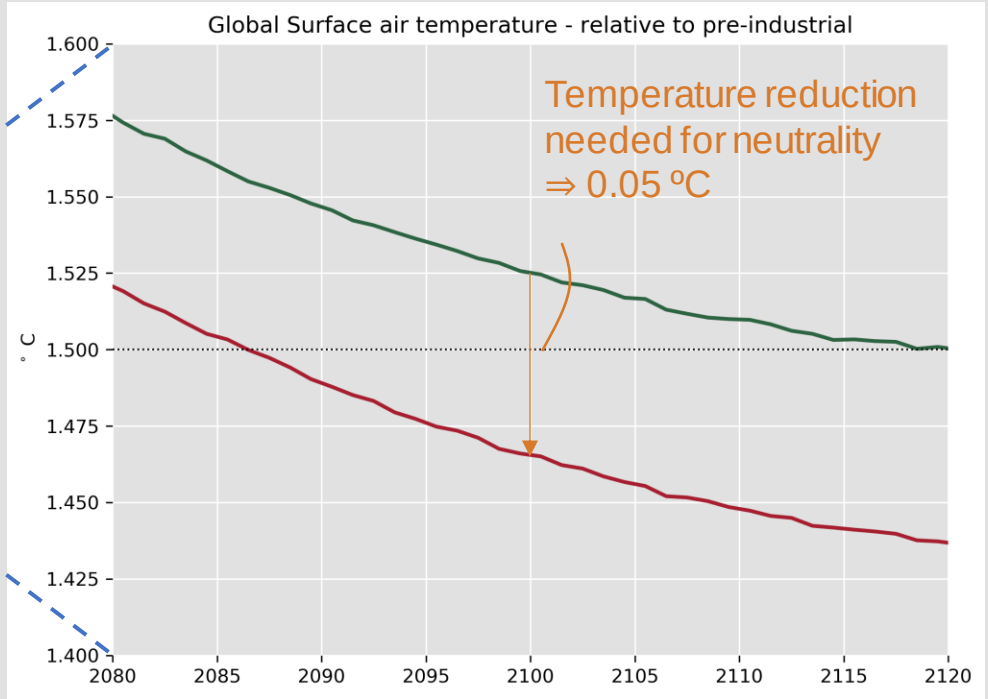
Climate neutrality

Reforestation can help achieve climate neutrality

Aided by enhanced plant productivity under CO_2 fertilization

Climate neutrality not completely achieved with reforestation offsets





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Key Points

Reforestation offsets by enhanced plant productivity under CO_2 fertilization

Reforestation can help achieve climate neutrality

Climate neutrality not completely achieved with reforestation offsets

Stringent emissions reductions remains best option

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